# THE SUPPLEMENTAL APPROPRIATION BILL, 1959

UNIVERSITY
OF MICHIGAN
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MAIN
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ADDITIONAL

## HEARINGS

BEFORE

## SUBCOMMITTEES OF THE COMMITTEE ON APPROPRIATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FIFTH CONGRESS

SECOND SESSION

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## NATIONAL RADIO ASTRONOMY FACILITY, NATIONAL SCIENCE FOUNDATION

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# THE SUPPLEMENTAL APPROPRIATION BILL, 1959

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MONDAY, JULY 14, 1958.

## NATIONAL SCIENCE FOUNDATION

NATIONAL RADIO ASTRONOMY FACILITY, GREEN BANK, W. VA.

WITNESSES

NATIONAL SCIENCE FOUNDATION

ALAN T. WATERMAN, DIRECTOR
PAUL E. KLOPSTEG, ASSOCIATE DIRECTOR (RESEARCH)
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LLOYD V. BERKNER, PRESIDENT

DEPARTMENT OF THE NAVY

CAPT. A. B. METSGER, DEPUTY AND ASSISTANT CHIEF OF NAVAL RESEARCH, OFFICE OF NAVAL RESEARCH
J. H. TREXLER, RADIO COMMUNICATIONS ENGINEER, NAVAL RESEARCH LABORATORY
COMDR. E. G. CUNNEY, FACILITIES OFFICER, OFFICE OF NAVAL RESEARCH

Mr. THOMAS. Gentlemen, the committee will please come to order.

We have with us this morning our friends from the National Science Foundation and the Navy.

It is certainly a pleasure to see Dr. Waterman again. We have not seen him now for about a week or 10 days. Our genial friend, Dr. Klopsteg, we understand we are going to lose. We do not like that. Mr. Randal Robertson, Assistant Director for Mathematical, Physical, and Engineering Sciences, Mr. Luton, Assistant Director for Administration, and Mr. Sheppard, Comptroller.

Our very distinguished friend, Dr. Berkner, with Associated Universities is here.

We have Captain Metsger, Deputy Chief of Naval Research, the Office of Naval Research, Mr. Trexler, radio communications engineer of the Naval Research Laboratory, and Commander Cunney, facilities officer, Naval Research.

About 10 days or 2 weeks ago we were discussing with the National Science Foundation the establishment of a facility in West Virginia. We made a good record, I thought, and had the matter in shape to submit to the full committee for its recommendation. Then we picked up the newspaper a day or two thereafter and it said that the Navy was establishing an installation not only in the same State but in the same area. It gave the impression that the north boundary of one installation was the south boundary of the other, stating that the Navy would spend $60 million on its installation of the same or similar type, and that the National Science Foundation would spend $55 million.

We in this room happen to have a little knowledge of the last figure. It had a political overtone, and all in all I thought it might be well for interested persons to state exactly what the facts are.

I have discussed the matter with the military subcommittee clerks, and they say the Navy installation has perhaps been authorized. What the authorization is, I am not quite sure. We shall look up the precedents in the House rules. Certainly there is some language in the last public works bill for the Department of Defense which passed the House which may be broad enough to cover that project as an authorization, unless someone attacks the item. If it should be attacked, I doubt that the Parliamentarian would hold that it is a valid authorization. An authorization, in my judgment, is just what it says it is. You have to be able to authorize something specific. Under this hideaway language it is something else.

Still, that is not the point. For our purpose here we shall assume that it has been authorized.

We would like to know on the record, putting as much on the record as is advisable—and you will be the judge of what is advisable and what is not advisable for the record—whether or not there is any duplication. We would like to have some cost figures, whether it has been authorized by the National Science Foundation in connection with the President's Committee on Science, whether it has been authorized in conjunction with a mutual study of the National Science Foundation and the Navy Department. It is our understanding that the National Science Foundation was set up as a scientific coordinating agency for all the Government, which includes Army, Navy, and everybody else.

Dr. Waterman, what do you have to say?

Dr. WATERMAN. I have a statement, Mr. Chairman, following which, if it is agreeable to the committee, I would like to ask Captain Metsger, Deputy Chief of Naval Research, to speak to the Navy program and answer questions there.

As you know, we have Dr. Berkner here, who is president of the Associated Universities, Inc., with whom the National Science Foundation made the contract for this work. Dr. Berkner, as you know, is

also acting director of this project. So he can speak to the present status and the programing of that.

Mr. THOMAS. Proceed.

## GENERAL STATEMENT

Dr. WATERMAN. Mr. Chairman and members of the committee, I should like to review briefly the development of the national radio astronomy facility at Green Bank, W. Va., the construction of which is being financed by the National Science Foundation. In this review I will deal particularly with those aspects pertinent to questions which have been raised as to the relationship between this facility and a radiotelescope to be constructed as a military installation at Sugar Grove, W. Va.—about 30 miles from Green Bank.

With your permission I will first summarize the relationship between the two facilities as we see it, and then discuss in turn the following points which I believe are very pertinent to the questions you have in mind: (1) the bases upon which the project was originally conceived and developed; (2) the step-by-step process by which the geographical site was selected; (3) the extent of consultation between the Foundation and the Navy Department as planning for the Green Bank project proceeded; and finally, comparison of the scientific capabilities of the two instruments and the extent to which one can complement the other on selective occasions.

In essence, the Sugar Grove facility will be a military installation of an operational character and dedicated to the discharge of a military mission. The Radio Astronomy Observatory at Green Bank will be a research facility, used exclusively by and for civilian radio astronomers and of course on unclassified research. It is dedicated to fundamental scientific research in radio astronomy in particular and to the progress of science in general.

Mr. THOMAS. Doctor, do you mean that here is a facility and it is good only for one thing, that on Saturday night the military could not use it and Monday morning the civilians could not use it?

Dr. WATERMAN. You mean the Navy one?

Mr. THOMAS. Whenever you put the name on it, the name changes its usefulness. Is that what you meant by that statement?

Dr. WATERMAN. Not if I understand you, Mr. Chairman. Ours, of course, will be devoted to scientific research and exclusively to that.

Mr. THOMAS. Is there any law against the Navy and the National Science Foundation jointly using the facilities?

Dr. WATERMAN. The Green Bank one?

Mr. THOMAS. Either one.

Dr. WATERMAN. So far as basic research is concerned, any basic research which is of interest to the Navy of course could be carried on at the Green Bank one.

Mr. THOMAS. Go ahead with your statement. Excuse me for interrupting. We will discuss that later.

Dr. WATERMAN. The Green Bank installation will be characterized by complete freedom for scientific investigation with research results being freely available to scientists throughout the world. While the primary objectives of these two facilities are in rather total contrast, both facilities serve a vital national interest. I will come back to these

comparisons later in my statement, but with the committee's indulgence I will now chart in some detail the progress of the Green Bank facility up to the present time. Some of this is a repetition of testimony given the committee in prior years and as recently as 2 weeks ago in connection with our fiscal year 1959 supplemental budget request. However, I believe that such a review is essential in order to furnish the context within which the relationship between the Sugar Grove and Green Bank facilities can be assessed.

## BASIC CONCEPTS

The original concept of the National Radio Astronomy Observatory now located at Green Bank grew out of two conferences held in 1954. The first was held in Washington in January 1954 under the sponsorship of the National Science Foundation, the Carnegie Institution of Washington, and the California Institute of Technology to examine into the state of research in astronomy in the United States, the scientific problems to be considered, and the need for large-scale radio telescopes. The conference brought out the need for large antennas if significant research is to be carried out in radio astronomy. The importance of the large antenna is the high gain, as it is technically called, that makes possible the reception of very faint signals from outer space and the large aperture or diameter that provides the sharp resolution needed for locating sources of radio signals accurately.

It was clear from the first conference that, although the science of radio astronomy originated in the United States, we were lagging behind other countries in this field. In Great Britain, Australia, The Netherlands, and Russia there were active plans for the construction of large antennas, and some instruments of substantial size were either already in operation or under construction.

As the result of this conference, Associated Universities, Inc., was requested by a group of scientists from Harvard, Massachusetts Institute of Technology, and the Naval Research Laboratory to act on their behalf in exploring with the National Science Foundation the feasibility of a radio astronomy facility that would be available to scientists throughout the country.

These developments formed the basis for a second conference held in New York in May 1954 and which in turn led to a study undertaken by AUI with two primary objectives: (1) Studies of the design and limiting characteristics of large steerable radio telescopes; and (2) a search for and selection of a suitable site for an observatory together with the preparation of a possible plan for its development.

## FEASIBILITY STUDY

As the first step in carrying out the study, AUI appointed an ad hoc committee to establish the feasibility of constructing a large radio telescope. The committee was composed of representatives of Harvard College Observatory, Mount Wilson and Palomar Mountain Observatories, University of Michigan, Cornell University, Ohio State University, University of Chicago, Carnegie Institution of Washington, Massachusetts Institute of Technology, and the Naval Research Laboratory.

On the basis of a proposal received from the ad hoc committee, the Foundation made a grant to the AUI to carry the feasibility study. The principal objectives of the feasibility study included (1) a survey among scientists actively interested in the field of radio astronomy in order to establish a program of research objectives; (2) an examination of the various suggestions made regarding the major items of equipment in order to gain some understanding of the technical problems of design and construction that must be solved and to be able to compare performance and costs (you understand this is really a pioneering venture and a great deal of detail had to be studied here); (3) an examination of possible sites and their comparative desirability; and (4) the development of preliminary estimates of the costs involved.

The ad hoc committee was then reconstituted as a steering committee for the project in February 1955 and the site survey was started immediately.

### SELECTION, ACQUISITION, AND DEVELOPMENT OF THE SITE

The basic specifications for the site were developed from a series of studies and discussions among the participating scientists and engineers. The specification of paramount importance was of course freedom from radio noise and electrical interference. The fundamental sensitivities to which radio telescopes can operate on any frequency are directly proportional to the ratio of the desired signal to external noise. Therefore, the usefulness of the site is inversely proportional to the interference noise.

One of the items of first importance is to find a location where this interference noise is kept to a minimum so one can hear the desired signal.

The necessary conditions to avoid such noise include the following:

1. Isolation from inhabitants whose work would generate electrical interference and from high tension power lines.
2. The site should be at least 50 miles distant from any city or other concentration of people or industries, and should be separated from more distant concentrations by mountain ranges.
3. The site should not be near commercial air routes, nor in a region where commerce or industry are likely to intrude or grow in the future.
4. The site should be in a valley surrounded by high ranges of mountains on all sides, if possible, to reduce diffraction of topospheric propagation into the valley.

In addition, the site needed to be located sufficiently far south to permit observation of the Milky Way while still permitting research involving the aurorae, ionospheric scintillation and polar blackouts. The site also required a climate without excessive snow and ice, freedom from high winds and of reasonable mildness and low humidity.

Finally, the site should be located in an area most readily accessible to the majority of astronomers.

Consequently, the criteria established by the research requirements of the telescope materially reduced the geographic possibilities for the site.

The physical requirements of the site are twofold: First, the total acreage must be large enough so that a number of independent research projects can be underway concurrently without interference; secondly, that the site include large relatively flat areas suitable for the installation of arrays required for observations at long wavelengths. The mission at Sugar Grove has no such requirements and therefore does not need such a large flat area for arrays or for installation of equipment of visiting scientists.

Mr. THOMAS. That is the military installation you are talking about?

Dr. WATERMAN. This is the military installation, which does not require this flat area for installation of equipment for visiting scientists.

In the spring of 1955, an ad hoc panel was formed to assist in the search for possible sites. The membership was composed of representatives from the University of Virginia, the Tennessee Valley Authority, the National Science Foundation, Associated Universities, Inc., Harvard University, the Naval Research Laboratory, Vanderbilt University, the Geological Survey, and the State geologists of Tennessee, Virginia, and West Virginia.

In addition to the site survey carried on by the ad hoc panel, independent surveys were made by the United States Forest Service and the Geological Survey to make certain that all possible sites were considered and to determine whether any land already owned by the Government might be suitable.

In all a total of 30 possible sites in 5 States were considered. Radio noise measurements were made by an independent firm to determine comparative noise level data at the sites.

By the end of 1955 the site possibilities had been narrowed to five that seemed to be the most promising. Inspection trips were made to these sites during December and the steering committee unanimously voted to recommend Green Bank, W. Va., to the Foundation as the best possible site for the establishment of a National Radio Astronomy Observatory. The site at Green Bank is almost ideal as indicated by the following rating for the three best sites:

| | Green Bank, W. Va. | Deerfield, Va. | Massanutten, Va. |
|---|---|---|---|
| Radio noise measurements | 1 | 2 | 3 |
| Population studies | 1 | 2 | 3 |
| Airport activities | 1–2 | 1–2 | 3 |
| Mountain shielding | 1 | 2 | 3 |

Green Bank came first in all respects ahead of Deerfield, Va., and Massanutten, Va.

In August 1956 a report, Plan for a Radio Astronomy Observatory, was submitted to the Foundation by Associated Universities, Inc., which included the results of the site survey which I have outlined, studies of telescope designs, and a plan for the establishment and operation of a National Radio Astronomy Observatory. Four million dollars was appropriated for construction of the Observatory in fiscal year 1957 and on November 17, 1956, the National Science Foundation entered into a contract with Associated Universities, Inc., for the con-

struction and operation of the National Radio Astronomy Observatory.

As soon as the contract was signed, arrangements were made with the Corps of Army Engineers to acquire the land for the site. The site consists of approximately 2,700 acres almost all of which has been acquired. Ceremonies marking the beginning of construction of this facility were held on October 17, 1957.

The Observatory, when completed, will have a 140-foot telescope and an 85-foot telescope. A contract has been let for construction of the 85-foot telescope and it is expected to be in operation this fall. A contract with the E. W. Bliss Co., of Canton, Ohio, has been signed and is being executed for the required engineering for the telescope and a contract for the complete construction and erection of the telescope has been signed and will be executed as soon as funds are available.

Mr. THOMAS. Do you mean by that you signed a contract binding the Government without any money, Doctor?

Dr. WATERMAN. This is for carrying out the work as soon as funds are available, Mr. Chairman.

Mr. THOMAS. Is it a binding contract?

Mr. LUTON. Mr. Chairman, the contract has an option clause in it covering the fabrication and construction of the instrument, which will not be put into effect unless funds are made available. This is a provision in the contract.

Mr. THOMAS. Go ahead.

### CONSULTATION BETWEEN NATIONAL SCIENCE FOUNDATION AND THE DEPARTMENT OF THE NAVY

Dr. WATERMAN. Next I should mention that from time to time and at various stages in the development of the Green Bank project the Foundation has consulted with representatives of the Navy Department regarding the relationship between the two facilities. At the outset it was clear that from the standpoint of the activities to be carried on at each, there was no conflict or overlapping from a program or financial standpoint.

From that time on, the Foundation confined its consultations to such matters as avoiding electronic interference between the two instruments, which of course was quite important since they were in the same area. For reasons which I am sure you understand the Foundation studiously refrained from inquiring into the operational aspects of the Sugar Grove facility. Because of these considerations, information to the Congress regarding Sugar Grove has come only from the Department of Defense, and the Foundation has not felt free to take the initiativie in mentioning the matter in testimony to this committee. We have assumed that through cross membership on the two subcommittees concerned appropriate information would be made available.

And in addition, of course, the plans for the Sugar Grove installation were much further behind and had not reached fruition.

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CAPABILITIES AND UTILIZATION OF THE TELESCOPES AT GREEN BANK AND SUGAR GROVE

The 140 foot radio telescope at the National Radio Astronomy Observatory is specifically designed to carry out a program of basic research in the field of radioastronomy. The telescope has therefore been designed to operate at higher frequencies than are planned for the telescope at Sugar Grove. The principal objective of the National Radio Astronomy Observatory is to advance our fundamental knowledge of the universe and the laws that govern its behavior, by observing and investigating the radiofrequency radiation emanating from celestial objects. The telescope will be used in the investigation of:

(1) The continuous radiation from our own galaxy and from other galaxies;

(2) Discrete sources of radio radiation;

(3) Solar radio emission;

(4) The solar system; and

(5) The 21-centimeter line emission and other line emissions. The 21-centimeter line emission is the hydrogen line.

Such research will contribute significantly to the fields of astronomy, physics, and geophysics. The Observatory will be directed to an increased understanding of the phenomena involved in these fields.

It is important to note that the Sugar Grove facility has been designed primarily for carrying out actual military and preparedness operations. During the relatively short periods of time when the Sugar Grove facility is not required for such purposes it would be possible to convert it to use for astronomical research. When the difficulties of such conversion are taken into consideration with the limited time available for such research the Sugar Grove facility could only be used for a small number of astronomical projects at frequency ranges where it is more efficient than the Green Bank Observatory.

The Green Bank facility, on the other hand, will be used 100 percent of the time for basic research in radio astronomy and related fields. The only priorities in the Green Bank Observatory will be those determined by the scientific merits of the research to be performed. There will be no security restrictions on its operations, and all useful research results will be published and made available to astronomers throughout the world.

Many of the skills required to operate the Green Bank and Sugar Grove facilities will be similar, although the former will be under the direction of astronomers and the latter under the direction of military operational personnel for military purposes. There is much to be gained from close technical cooperation between the two installations. It will be a great national asset if the Sugar Grove facility can do cooperative work with the National Radio Astronomy Observatory and if the military mission of the facility will permit even limited time for use of the facility for scientific purposes, in which case, of course, there would be full cooperation between the two. It is expected that the time available for scientific work which is permitted by the military function of the Sugar Grove facility will be used in such cooperative research.

I should like to emphasize, Mr. Chairman, that the Green Bank National Astronomy Observatory is a thing which, as you see, has been planned and thoroughly endorsed by the radio-astronomers and

astronomers of the country as the leading precision instrument for these purposes. There are a number of installations throughout the country, but this one will really spearhead the approach to the scientific investigation of radioastronomy. It will put the United States in position to collaborate and compete in this field with other nations, and the importance of that is very considerable, especially as we approach the so-called space age when the observations in outer space may be related to such matters as observation made by satellites.

COORDINATION OF THE TWO ASTRONOMY FACILITIES

Mr. THOMAS. You state the Science Foundation project is much older than the military project. It was conceived and started first; is that correct?

Dr. WATERMAN. Yes, sir.

Mr. THOMAS. Were the Foundation, the White House, Dr. Killian, and the President's Science Committee consulted when the Navy started its project?

Dr. WATERMAN. I believe so, yes.

Mr. THOMAS. You believe so? Was the National Science Foundation consulted or asked to cooperate or advise?

Dr. WATERMAN. Only on the scientific part of the program; that is, the basic research which might be carried on. It is not the Science Foundation's concern to deal with programs of a military nature.

Mr. THOMAS. Doctor, the basic law which puts the National Science Foundation in business states that it is your job to coordinate scientific research of all Government agencies. I am asking you, Was the National Science Foundation consulted by the Navy Department on the scientific aspects of its project?

Dr. WATERMAN. We have been in close touch on the scientific aspects, and I mean by that basic research, because that is as far as the Foundation goes, not the application to military uses.

Mr. THOMAS. You agreed in it?

Dr. WATERMAN. The extent of the agreement was that in any way in which the Navy installation could be used for basic research, we would collaborate. Obviously we had to collaborate on the technical details to be sure that any Navy installation would not interfere with the purposes of the one at Green Bank.

Mr. THOMAS. Doctor, I will read into the hearing subsection (6) of section 3 entitled "Functions of the National Science Foundation."

Did I hear somebody comment?

Mr. RUTTENBERG. Go ahead, sir. You were going to read the section I was about to refer to.

Mr. THOMAS (reading):

To evaluate scientific research programs undertaken by agencies of the Federal Government.

That is talking about your organization now.

* * * and to correlate the Foundation's scientific research program with those undertaken by individuals and by public and private research groups.

That is the purpose of my question.

Carrying it one step further, did the Science Foundation and the Navy Department discuss it with Dr. Killian, the President's scientific adviser?

I am talking about the Navy project now. Dr. Killian was not over there when you started yours.

Dr. WATERMAN. This was discussed, as I stated in my testimony, from the very beginning with the Navy with respect to any basic research it might do, but the Foundation is not prepared to enter into the reasons for any military uses.

Mr. THOMAS. Just stay within your narrow authority, basic research. That is all I am talking about. I am asking you now if you and the Navy discussed the basic research project along with Dr. Killian over at the White House.

Dr. WATERMAN. This has been done, yes, sir.

Mr. THOMAS. And he agreed, too?

Dr. WATERMAN. I do not know in what form Dr. Killian made any report on this. You see——

Mr. THOMAS. Did you make any report on it and, if so, to whom did you make it?

Dr. WATERMAN. Only to the extent of our interest in the basic research aspects of the project.

Mr. THOMAS. Will the same scientific personnel which operate the Science Foundation project also operate the Navy's?

Dr. WATERMAN. No. This is the Navy's job. It is in Navy personnel hands. Captain Metsger is prepared to make a statement about the Navy's position on this, Mr. Chairman.

Mr. THOMAS. Captain, tell us about your project.

### MISSION OF THE NAVAL RADIO FACILITY

Captain METSGER. Mr. Chairman, the mission of the naval radio facility in West Virginia is primarily one of military operations, with a secondary task of research bearing on military problems of communication, navigation, and space physics.

Mr. THOMAS. Could the Science Foundation laboratory serve your purpose?

Captain METSGER. A minor part of this possibly could be done, sir, but the applied research solving military problems of communication and navigation we would expect to find in the military, sir, in our own complex.

Mr. THOMAS. You will have an operational installation which is to do day-to-day military work, and basic research is not involved in that day-to-day work. Is that correct?

Captain METSGER. The primary mission and the purpose of being of the Sugar Grove facility is operational, sir. A certain amount of time might be available over and above the operational requirement and maintenance, as I cover here a few words later. I have a very short statement on this subject.

Mr. THOMAS. Go ahead.

Captain METSGER. The operational mission, which includes both communication and navigation, is scheduled to occupy most of the time of the facility's main instrument. It will provide interference-free communication channels for use by our ships and at the same time is capable of providing them with assistance in navigation. The military research activity and necessary maintenance work will consume most of the remaining time. However, it is planned that all

available free instrument time will be used for pressing basic research problems in the field of radioastronomy. Here is where we relate to the National Science Foundation. This is a very minor part of the plan for this instrument.

Some releases have emphasized the basic research capabilities of the instrument, these being of most interest to the general public.

Application of the spare time of the instrument to radioastronomy will not conflict with or be a duplication of effort with any other facility, and will insure a maximum return from the investment. This large instrument will cover vital parts of the radio spectrum of most interest for military applications, but it is not designed to cover the high-frequency range of particular interest in radioastronomy.

I would be glad to discuss further anything I can, sir.

Mr. THOMAS. Captain, that is a very clear and crisp statement. What is the genesis of your project? Who originated it?

HISTORICAL SUMMARY OF THE NAVY RADIO FACILITY

Captain METSGER. This project stemmed from work which was done at the Naval Research Laboratory, sir. I am very happy to have the man who is primarily responsible for this whole concept here with me today—Mr. James Trexler, on my left.

Mr. THOMAS. Tell us about it.

Mr. TREXLER. Would you like to know exactly the history of how we started on this job, sir?

Mr. THOMAS. Briefly.

Mr. TREXLER. Briefly, we were asked in 1951 by the Chief of Naval Operations to look into the possibilities of doing the kind of job the captain has been describing here.

Mr. THOMAS. He has not described much, but go ahead.

Mr. TREXLER. He described as much as he feels he can at the moment.

Mr. THOMAS. All right. We understand.

Mr. TREXLER. The laboratory started on this job actively with funds from the Office of Naval Research in the spring of 1952, and we were doing experimental work by the summer of 1952. Since that time we have carried out a continuous program in this direction, and we determined the type of instrumentation we would need to fulfill the basic mission in about 1954.

Mr. THOMAS. You and Dr. Berkner's group were working hand in glove in those days?

Mr. TREXLER. 1954 is too early a date to talk about cooperation here between these two projects, but about——

Mr. THOMAS. Dr. Berkner has been active in this area for about 15 years.

Mr. TREXLER. Yes, sir.

Mr. THOMAS. Go ahead.

Mr. TREXLER. It was about this time that we started a site survey which was worldwide in the beginning and was gradually narrowed down to roughly the West Virginia-Virginia area. It was at this time that we became very closely associated with the groups who were working on similar site surveys for the National Science Foundation. We worked very closely in the field with these survey teams.

The Navy teams and the National Science Foundation survey teams used three sites in the general Virginia-West Virginia area.

Mr. THOMAS. Anyway, you are satisfied you have a good site there?

Mr. TREXLER. We have a good site, and it is very closely correlated.

Mr. THOMAS. You are going to perform a very needed and useful day-to-day military job; is that true?

Mr. TREXLER. Yes, sir.

Mr. THOMAS. You are more definite than the captain.

SITE COST OF THE NAVY FACILITY

Captain, how much money are you going to spend for this project? How many acres of land? What are you paying for it? How much does the land cost? How much do you have? What are the road costs? What are the building costs? How many buildings are you to have? Then, last, what are your operational costs on an annual basis?

Captain METSGER. Let me start, sir, by saying that the principal land in which we are interested has been in the George Washington National Forest, but there is procurement of land necessary in addition.

Mr. THOMAS. How many acres in total of Government land and how many will you have to buy?

Captain METSGER. Let me check these figures. About 1,800 acres is the amount of land which we must buy. We shall retain about 400 acres. The difference will be turned over to the national forest.

Mr. THOMAS. What are you paying for the 1,800 acres?

Captain METSGER. For this land procurement we have $160,000, Mr. Chairman. It appears that this will adequately cover the purchase.

Mr. THOMAS. How much is that per acre?

Commander CUNNEY. It varies, sir, from $40 to about $120. Some of the acres are bottom land and a little bit of farmland. Most of it is rocky, forest-covered land. There are a few small farms.

Mr. THOMAS. Is the north boundary of your land the south boundary of the National Science Foundation project?

Captain METSGER. No.

Mr. THOMAS. How much intervening land is there?

Dr. WATERMAN. Thirty miles, I believe.

COST OF NAVY RADIO FACILITY

Mr. THOMAS. What will the improvements cost, Captain?

Captain METSGER. The total cost under our current authorization up through fiscal year 1959 is $79 million.

Mr. THOMAS. Where is your current authorization? Is that section 202 of H. R. 13015?

Commander CUNNEY. Yes, sir.

Mr. THOMAS. From that authorization, can you tell what you are to build there?

Captain METSGER. Commander Cunney.

Commander CUNNEY. Not from the wording of that authorization; no, sir. The supporting documents are all classified.

Mr. THOMAS. Do you consider those documents classified?

Captain METSGER. Yes, sir.

Mr. THOMAS. You are not planning to construct any hotels, swimming pools, or dancehalls there, are you?

Captain METSGER. The general nature of the construction, Mr. Chairman, I can speak of, and that is the specific radio facilities, the operational antenna, a smaller 60-foot pilot antenna, the various operational buildings, including——

Mr. THOMAS. Do you intend to spend the whole $75 million? Do you have any firm plans? Is this a guess figure? Is it 10 percent correct or 15 percent correct? Will you have an overrun or surplus?

Captain METSGER. This is a figure which is based on a thorough design study and cost analysis and, assuming no unforeseen difficulties and no changes in the cost of things, this would hold.

Mr. THOMAS. Did you give out that statement which appeared in the newspaper that it is costing $60 million Was that a leak or a press release?

Commander CUNNEY. If I may answer that, sir—Mr. Chairman, in section 202 we have actually $60 million authorized in this bill.

Mr. THOMAS. Which bill?

Commander CUNNEY. In H. R. 13015. Actually, $60 million is authorized for this fiscal year.

Mr. THOMAS. Of the $75 million, you have an authorization of $60 million?

Commander CUNNEY. We had a previous authorization of $1.3 million in 1957, and $6.6 million in 1958, and we have another authorization the Navy requested for 1960, making a total of about $79 million.

Mr. THOMAS. I see. The total for this one project is $79 million.

Commander CUNNEY. Yes, sir.

Mr. THOMAS. This may be an authorization, but you cannot tell from the language. My guess is that if some Member raised a point of order against the project that it has not been authorized, you might be in trouble, because I think an authorization is just what the language intends. It must be clear and reasonably defined so you know what you are authorizing. This says lands, projects, and so forth and so on. I may be wrong.

Did the Navy give out a press release on this item?

PRESS RELEASE ON THE NAVY RADIO FACILITY

Captain METSGER. The Department of Defense issued a press release, sir.

Mr. THOMAS. Do you have a copy of it available?

Captain METSGER. I can provide a copy.

Mr. THOMAS. Will you provide it at this point in the record?

(The press release follows:)

DEPARTMENT OF DEFENSE,
OFFICE OF PUBLIC INFORMATION,
*Washington, D. C., June 17, 1958.*

NAVY PLANS CONSTRUCTION OF NAVAL RADIO RESEARCH OBSERVATORY AT SUGAR GROVE, W. VA.

**A $60 million radio astronomy facility, known as the Naval Radio Research Observatory, is planned for construction in the mountains of West Virginia near Sugar Grove, the Navy announced today.**

**The project, which is scheduled to begin after mid-August, will culminate 11 years of intensive research in the field of radio astronomy by the Naval Research Laboratory in Washington, D. C.**

The 1,500-acre facility will be the site of a giant radio telescope used in receiving electronic emissions from outer space, and will contribute greatly to basic knowledge of the complex physical processes that occur in outer space.

NRRO will be one of the foremost scientific tools available, not only in studies of outer space, but also in advanced scientific research on characteristics of the earth's atmosphere, and geodetic and geomagnetic data on the earth itself.

The facility will be operated under Navy management as a common service to the Nation's scientific community and Defense Establishment.

Successful establishment of a feasible design, under the coordination of the Bureau of Yards and Docks, represents a notable accomplishment in the field of construction engineering, Navy officials said.

Mr. YATES. Why did the Department of Defense issue a press release if this is a classified project?

Captain METSGER. There is no classified material in the press release, sir.

Mr. THOMAS. Gentlemen, may I read aloud this press release, dated June 17?

Navy plans construction of Naval Radio Research Observatory at Sugar Grove, W. Va.

A $60 million radio astronomy facility—

You did not have firm plans then. It is $60 million here, and now you say it is $79 million. Where did you get all these firm plans?

is planned for construction in the mountains of West Virginia near Sugar Grove, the Navy announced today.

The project, which is scheduled to begin after mid-August, will culminate 11 years of intensive research * * *.

The 1,500-acre facility will be—

so and so.

MISSION OF THE TWO FACILITIES

My concern, Captain, Dr. Waterman, Dr. Klopsteg, and gentlemen, is whether there is any duplication, any waste of funds which could be saved by the military using the National Science Foundation project or the Foundation using the one of the Navy and thereby eliminating one.

First, what is your answer, Dr. Waterman?

Dr. WATERMAN. No, sir. The one at Green Bank could not be used for Navy purposes.

Mr. THOMAS. Dr. Berkner, what is your answer?

Dr. BERKNER. There is no duplication, Mr. Chairman.

Mr. THOMAS. Dr. Klopsteg, what is your answer?

Dr. KLOPSTEG. No duplication.

Mr. THOMAS. Captain, what is your answer?

Captain METSGER. There is no duplication.

Mr. THOMAS. Mr. Trexler, what is your answer?

Mr. TREXLER. No duplication in mission.

Mr. THOMAS. Commander?

Commander CUNNEY. No duplication.

Mr. THOMAS. Mr. Yates.

Mr. YATES. One would get a different impression from this press release.

Commander CUNNEY. Yes, sir.

Mr. YATES. Because the press release for the Navy Research Radio Observatory to which the chairman has referred could very well serve as a description of the justification for the project of the National

Science Foundation. He read part of it, but then the press release goes on further and says:

> The 1,500-acre facility will be the site of a giant radio telescope used in receiving electronic emissions from outer space, and will contribute greatly to basic knowledge of the complex physical processes that occur in outer space.
>
> NRRO will be one of the foremost scientific tools available, not only in studies of outer space but also in advanced scientific research on characteristics of the earth's atmosphere and geodetic and geomagnetic data on the earth itself.
>
> The facility will be operated under Navy management as a common service to the Nation's scientific community and Defense Establishment.

Then the release states that the establishment of a feasible design is under the coordination of the Bureau of Yards and Docks.

This says absolutely nothing about military purposes for the facility at all.

Mr. BOLAND. That is classified.

Mr. YATES. But the phrase "military purposes" is not classified. I can very well understand how anybody reading this press release could say, "Why should the National Science Foundation be building a facility when the Navy is building a similar one within close proximity?"

Captain METSGER. May I clarify part of this, sir.

At the time that release was made, any discussion of communications was classified. Because of the confusion that this release could cause, which we assumed it had caused, we felt it would be best to declassify the relation of this to communication. So this is new information when I talk about the communications here today.

Mr. THOMAS. The newspaper article was printed 10 or 11 days before your announcement, Captain.

Dr. KLOPSTEG. Mr. Chairman, the press release is dated the 17th of June, and the newspaper article is July 5.

Mr. THOMAS. I beg your pardon. I am in error.

AVAILABILITY OF THE NAVY FACILITY FOR RESEARCH

* * *

Mr. YATES. Can you tell us what portion of the time this facility will be devoted to military uses and what portion it will be devoted to scientific uses?

Captain METSGER. The vast majority of the time, we estimate, will be devoted to military uses, including maintenance.

Mr. YATES. Who will be using your facilities for scientific purposes?

Captain METSGER. In the Navy we have a large and competent scientific operation supporting our military work. A part of this operation is the Naval Research Laboratory, a laboratory of which we are very proud. We do continuing scientific work in support of our military missions. We consider this to be a very solid and required part of the national basic research and scientific effort. We have a much stronger military because this goes on, sir.

Mr. YATES. Do you have people who can use this facility for scientific purposes?

Captain METSGER. We certainly do, sir.

Mr. YATES. Are your people different from those to whom reference was made when the National Science Foundation appeared before our committee?

Captain METSGER. There will be some overlap in the sense that our facility would be used by some radio astronomers who are interested also in the National Science Foundation, and indeed some people working, I presume, in the National Science Foundation instrument would be participating in scientific work here from time to time for the good of the whole scientific effort.

CAPABILITIES OF THE TWO TELESCOPES

Mr. YATES. Dr. Berkner was most persuasive in pointing out that the facility being constructed by the National Science Foundation will be the best in the world for scientific purposes. How will yours differ in its scientific aspects from that of the National Science Foundation? What will your facility be able to do in terms of radio telescope work which cannot be done by the National Science Foundation facility?

Captain METSGER. Our project is optimized for its military purposes and for most scientific purposes will be less effective than the Green Bank project, but for a few more specific words may I turn to Mr. Trexler.

Mr. TREXLER. I think maybe Dr. Berkner can talk as well as I can on this, or better, and maybe he should follow up.

The Navy's equipment is primarily intended to handle Navy problems, which are not following stars through the sky. You have a model over here of the National Science Foundation instrument. Our instrument is not mounted as that is along the polar axis of the earth. It is mounted more like conventional radar.

It is true that we can make ours point in the sky as the National Science Foundation instrument will and follow things through the sky, but with much more difficulty. It is not as refined in its movement and its tracking.

For instance, a sputnik going overhead would not be able to be handled by our giant specialized-purpose instrument, but we will be able to do some things. One thing is the penetration of space. We will be able to do somewhat better because we are to have a larger aperture than this, a bigger collecting area.

So at those frequencies where we can operate which are below the maximum frequencies or longer wavelengths than the National Science Foundation instrument, we will be able to penetrate further into space because we will have a bigger telescope, a bigger aperture. Scientists who want to make use of the Navy facility would have a chance to probe a little deeper and see what is on out past the limit of visibility.

Dr. WATERMAN. May I suggest Dr. Berkner comment on this?

Mr. YATES. Dr. Berkner told us that is one of the reasons this 140-foot parabola that the National Science Foundation is constructing will be fully as effective if not more so than that which exists in England at the present time, which is 250 feet.

Mr. TREXLER. That is right.

Mr. YATES. So, why does the size of the aperture give you greater efficiency?

Mr. TREXLER. The one in England, unfortunately, was made for even lower frequencies than the Navy one or this instrument. It was initially designed to work at about what we call 600 megacycles. They have since been able to improve it, so it is considerably better

than this. But at the frequencies of primary importance to radio astronomy, namely, the hydrogen line which you have heard so much about, which is at 1400 megacycles, the British instrument is beginning to lose its refinement. The new Navy instrument will be a fine instrument at that frequency.

Mr. YATES. How about the National Science Foundation instrument?

Mr. TREXLER. It will be excellent, even a better instrument at those frequencies than the Navy instrument. But at frequencies above the hydrogen-line frequency, the Navy instrument will cease being a fine instrument and the National Science Foundation instrument will carry on to 3, 4, or 5 times as high frequency.

Mr. YATES. How do you reconcile this with your earlier statement that you will be able to penetrate further into space than the National Science Foundation?

Mr. TREXLER. The collecting area of the Navy instrument will be many times larger than either the one in England or the one at the National Science Foundation. The Navy has not been permitted to release the exact size, but it has been stated publicly that it is bigger than 400 feet diameter.

### OTHER FACILITIES SUGGESTED BY THE FOUNDATION

Mr. YATES. Perhaps this question should be addressed to a later session with the National Science Foundation, but the question which comes to my mind is: Are there other facilities that the National Science Foundation contemplates constructing which parallel facilities which are being constructed by some other Government agency, or is this the only example?

Dr. WATERMAN. As Dr. Berkner testified last time, this is as far as we are prepared to go with respect to the plans for radio astronomy in the way of big installations.

Mr. YATES. I do not mean only in radio astronomy. Do you intend, or hope, to construct facilities in other scientific fields?

Dr. WATERMAN. In other fields, yes, sir.

Mr. YATES. Is there a possibility that the statement can be made that the facilities you contemplate construction are also being constructed by other branches of the Federal Government?

Dr. WATERMAN. We have looked into this very carefully in the case of all those research facilities, so we know what the plans of other Government agencies are, and, also, private groups and universities.

Mr. YATES. This is the only such case where there is a possibility that duplication exists, if one does exist?

Dr. WATERMAN. In the sense in which the comparison is made here, yes; that is true. Dr. Berkner could speak to your question.

Mr. YATES. We always like to hear Dr. Berkner.

Dr. BERKNER. Thank you, Mr. Yates.

### COORDINATION BETWEEN THE TWO FACILITIES

Mr. Chairman and gentlemen, we had been fully aware of the Navy's plans to go ahead with this military installation from the time they actively began looking for a site. In fact, one of our leading scientists, Dr. Emberson, has been fully cleared, and consulted

very closely with the Navy on this project. We have looked upon it as an almost wholly military project from the very beginning, and at Green Bank we had three interests in collaborating with the Navy on this subject.

The first was to give whatever assistance to the Government we could give——

Mr. THOMAS. Let me ask the doctor at this point one question which has been in my mind all morning. What will be the life of the Navy project?

Dr. BERKNER. I would not hazard an estimate.

Mr. THOMAS. You see what I am driving at. I am not being too definite.

Dr. BERKNER. I would suppose very long, Mr. Chairman.

Mr. THOMAS. Three or five years from now, assuming that the world will become normal and sensible and level again, would it have any useful life then?

Dr. BERKNER. I would suspect it would have a useful life in the foreseeable future as long as the Navy continues to be important, and I think it will continue to be important for a long time.

Mr. THOMAS. Will you stand in that statement?

Dr. BERKNER. Yes, sir.

Captain METSGER. May I reinforce that one, sir? This project, we would estimate, as best we know now, will be very active as long as the security of the United States is important.

Dr. BERKNER. I agree with that.

Mr. THOMAS. Do you agree, too, Dr. Trexler?

Mr. TREXLER. Yes, sir. We have been asked, very pointedly, to determine the life expectancy of the machinery we are building to see if it is long enough.

Dr. BERKNER. As I was going to say, we had three interests. The first was to give whatever assistance we could give to the Navy in the site surveys. Secondly, when it became apparent that, for the same reasons we located in the West Virginia area, it would also be advisable for the Navy to locate there, we wanted to be sure that no interference would occur between the two projects. Thirdly, for whatever time might be made available for research, we were keenly interested in the possibility of close cooperation, and this for a number of reasons.

One is that the 30-mile baseline would permit the two antennas to be used jointly as a single antenna (interferameter) for whatever time might be made available over a narrow frequency range. The two of them would have an effectiveness when used together of the product of the two antennas. Moreover, they would have a sharper discrimination between objects than almost any one in the world could possibly hope to get. We are not at all sure that any time for this purpose could be made available in the future, but as scientists we certainly hope that this is true. Secondly, there is the possibility of using one for transmission and the other for reception in order to explore particle beams traveling through space, to actually explore the planets to some extent themselves, and the sun, particularly to get much sharper ideas of how far they are away. At the present time we do not know the distance of say the planets or the sun with sufficient precision, and we could improve such measurements if we had time to use the two instruments together.

There are a whole series of cooperative measures that are made possible because of the proximity of the two projects which would permit us, we hope, to establish a very precise baseline between them. So for these three reasons we followed the Navy project very, very closely.

I must say we have always had our fingers crossed, knowing the basic reason for the Navy project, as to whether any time would become available, and we hope at some time in the future to be able to convince the Navy to permit some time to be available for scientific purposes so that these joint experiments can be initiated.

Mr. YATES. Then the press release was really camouflage.

COMPARISON OF THE CAPABILITIES OF THE TWO TELESCOPES

Dr. BERKNER. I would hesitate to try to read the mind of the Navy or the Department of Defense. I would point out that there are some very radical differences between the two antennas. The wind tunnel model that you see here was set up for wind tunnel testing of vibrational modes of the Green Bank telescope. We brought it down for you to see today. It has zenith coverage continuously which, I understand, the Navy telescope will not have.

The slew rates of this telescope are very high, and it would be possible to track satellites with this telescope. This is because it is equatorially mounted and it does not have excessive tracking rates through the zenith. That is because of the characteristics of its design as an optical telescope as contrasted with one used for other purposes. As Dr. Trexler pointed out, it is designed for precision frequency and will work with high efficiency from 800 megacycles to 12,000 megacycles. Imagine radio requencies to be colors in which the Navy telescope is primarily most efficient in what I would call the red, whereas this is most efficient at the blue, the other end of the radio frequency spectrum. The purpose of this telescope is to explore the color relationships of various radio sources so we can get at what causes the radio emission from these radio stars. The amount of power involved is very great, and we would like to know star by star what causes this radiation. I believe I once used the simile with the Federal Communications Commission when they were hearing the problems of frequencies in the neighborhood of Green Bank that the power of one of these radio sources is 10 with 20 zeros after it times the power of our most powerful television station, all broadcasting at the same time. We want to know why all these stars radiate differently. This is related to the physical processes that go on in the stars themselves.

The beam size of this telescope at the very high frequencies—the "blue" end of the radio spectrum—will be very much sharper than either the Navy telescope or any other telescope in existence, this by a factor of between 10 and 100. The speed with which we can make experimental changes on the telescope, it is designed for quick changes, is such that we can run several different experiments in the same day. While one astronomer may be interested in one part of the sky and another another part of the sky, we can switch from one experiment to another quickly. It is planned that this telescope be used on a 24-hour day basis to make these observations. Aside from the differences in telescopes, there is the difference in the site itself. Our site

has been deliberately designed to give larger areas of bottom land with mountains around to provide not only for protection against outside interference, but to provide a site which can be considered as a supplement to the university facilities. If a man is doing an experiment at a university with an array and he is troubled with noise, as he likely will be when he gets his apparatus working, he can bring it to Green Bank, lay it out on the bottom land and get very much better results because of the lower noise levels that he will experience in that area.

Many such experiments are planned, and indeed 1 or 2 of them are actually going on at the present time with cooperative measures with other institutions.

### RESEARCH PROGRAM AT GREEN BANK

The whole purpose of the basic research program at Green Bank is to provide for means to penetrate as far into the universe as possible on the blue end of the spectrum, as contrasted with the red end, where the Navy telescope will be more efficient. For example, there are two theories of why the universe behaves as it does at the present time. Apparently it is expanding. One is the theory that it started out with an initial explosion. The other is the theory of Hoyle in Great Britain and Gold at Harvard that there is continuous creation going on. It is very important to distinguish between these theories for a very practical reason. If continuous creation is going on, this means that gravitational fields are starting from particles where gravitational fields did not exist before, and for the first time we will have a look at the question of why particles have gravity, and if creation goes on, how this gravitational wave is propagated from the creation of new particles. I hardly need mention if we could find out something about the origin of gravity, we have made a real step forward.

I mentioned in the hearing the other day many of the other kinds of experiments that will go on, and I think it would be redundant to mention them here. I would hope to demonstrate by my remarks that the two facilities are supplementary to the extent that research can be made available from the Navy.

Let me be quite frank in saying that knowing the purpose of the Navy operation, I am very skeptical if any time will be made available.

### MAINTENANCE AND OPERATION COSTS OF THE TWO FACILITIES

Mr. THOMAS. Doctor, how much will it cost to maintain and operate this installation? A couple of years ago it was $200,000. Two weeks ago it was $800,000. What will it cost?

Dr. BERKNER. The appropriation we ask for this year is $400,000. When we get this instrument in full operation and working on a 24-hour basis, it will run between $750,000 and $800,000.

Mr. THOMAS. You are going to hold it at $800,000?

Mr. BERKNER. Sir, will you hold the value of the dollar?

Mr. THOMAS. What is it going to cost us, Captain, to maintain and operate your installation.

Commander CUNNEY. In full operation it will be several million.

Mr. THOMAS. What is several million?

Commander CUNNEY. Two million is our present estimate, but we have not firmed up all the operational requirements yet.

COMPARISON OF THE MISSIONS OF THE TWO FACILITIES

Mr. EVINS. Doctor, the Committee on Independent Offices Appropriations is sympathetic with the work of the National Science Foundation, and we know you are concerned with basic research. I must confess that all of you gentlemen over there have not clarified to my satisfaction the differences in the two operations. You say the mission of one is military and the other is for civilian purposes. You say one is for basic research purposes and the other is for security purposes of the military. In the minds of a lot of people throughout the country as a result of the press release and otherwise, an impression has been created that two operations are being built side by side simultaneously and overlapping. One arm of the Government apparently does not know what the other is doing. Which one of these developments had the original genesis? Was the Navy first with its plans or the National Science Foundation?

Dr. WATERMAN. The authorization and funds for it were first on the project of the National Science Foundation except that the Navy was then pursuing its preparations.

Mr. EVINS. It was my understanding that the National Science Foundation was first in this field, and you are concerned principally with basic research.

Dr. WATERMAN. As Captain Metsger testified, the Navy has had a program in this general area for a long time of a minor variety not concerned with the big dishes.

Mr. EVINS. They have been making some studies.

Dr. WATERMAN. Yes, preparing for this as a military project. Is that right, Captain?

Captain METSGER. Yes, sir, that is correct.

Mr. EVINS. Mr. Trexler stated that the Navy project is not for following the stars in the sky and you have testified that the Navy cannot handle the sputniks through your project. You put these operations both in the negative. It is not for surveying the stars and not for tracking the sputnik, but you do not tell us positively what it is for—the real purpose and need of your project.

Captain METSGER. Let me make a limited reply, if I may, on this one, sir. We discussed some time ago use of the moon as a reflector for communication purposes, and this is one conceivable method of using an instrument of this kind. But I cannot go into specific uses in communication or navigation. It can follow the moon, for example.

Mr. EVINS. Ships have been sailing the ocean since the times of Columbus and before and we have a great Navy, and they are going to continue to sail. What will this proposed facility do to facilitate the navigation of the Navy that we do not have at present?

Captain METSGER. This will enable us to achieve more precise navigation for modern military purposes and to achieve interference-free communication to an extent better than we can achieve now under certain conditions.

Mr. EVINS. If the Congress decided to limit the appropriation to delay this operation for a while until the National Science Foundation went forward with its program, how would it interfere or impede the operations of the Navy?

Captain METSGER. I can't answer that specifically, sir, unless we go into a classified session.

Mr. EVINS. This is an executive session. You can tell us what you desire. We can take it off the record later if necessary.

Captain METSGER. Mr. Chairman, to what extent may I speak?

Mr. THOMAS. Very freely. You can talk on the record or off, as you like. If you want to go into some classified matter, perhaps it would be better that no record be made of it.

Captain METSGER. Do we have anyone present who is not cleared about classified matters?

Mr. THOMAS. I do not know about that.

Mr. EVINS. You will have an opportunity to look over the record, and if there is anything you want to take off the record, you can do so.

Mr. JONAS. Mr. Chairman, we frequently have conversations off the record.

Mr. THOMAS. He is talking about something a little deeper than that. We better let him be the judge.

Captain METSGER. Let me go off the record.

Mr. THOMAS. Captain, if you feel that you ought not to talk, I think you can explain it to Congressman Evins and perhaps you and the Congressman can have a little session when the committee meeting is over.

Mr. EVINS. I am sure that I am not the only one concerned with wanting more information on the need and necessity for the project.

Mr. THOMAS. You are right. You will be the judge. That is all I am saying to you. If you think it would be better for you and Congressman Evins to have a private conversation, you may do so.

Mr. EVINS. This committee has approved the funds for the National Science Foundation to go ahead and it is my understanding that the National Science Foundation was first in this field, and now the Navy comes along with another operation, reportedly identical or very similar, almost adjacent to the same operation. The captain now tells us that there is no duplication and no overlapping. I am not convinced in my mind that there is not some duplication and overlapping. Dr. Waterman, of the National Science Foundation, has already testified that these two operations could be jointly used, and there could be some value to both of them working together. There is a lot of other indefinite language. Tell us what you have to have in your operation that the National Science Foundation does not have and cannot produce through its facility in this field.

Captain METSGER. Off the record.

(Discussion off the record.)

Mr SCRIVNER. Could I interject a word here a minute?

Mr. THOMAS. Surely.

Mr. SCRIVNER. I have read the statement of the doctor. I perhaps did not hear all of the detailed Navy presentation on this program, but I did hear a pretty fair share of it.

These scientists do not talk the same language that laymen do. Up to now I have not heard anything in this presentation as told by the Navy that the two are not for the same purpose.

Mr. EVINS. I did not hear the Navy presentation before the gentleman's subcommittee. That is why I am trying to find out if there is anything different in the operations, at this time.

Mr. SCRIVNER. I do not know why from what I have heard there are certain things, Captain, that you cannot state off the record, and I think a few of them stated would clarify just exactly what is going on. I do not find fault with that press release because I do not agree that everybody in the United States ought to know everything that the Navy is doing. When you start some activity you have to make a story, and that went just about as far as the Navy had any business going.

Mr. YATES. Why issue it at all?

Mr. SCRIVNER. Because there was activity taking place down there that was speculative and it was better to have some statement rather than the speculation that was circulated.

Mr. YATES. Except for the fact that the National Science Foundation was doing the same thing and immediately gave rise to the possibility that both were building the same thing.

Mr. SCRIVNER. I do not think they are doing the same thing.

Mr. EVINS. I want to say to my colleague for whom I have great respect and affection that this is the reason for this joint meeting of the Navy and officers of the Science Foundation.

Mr. JONAS. Mr. Chairman, may I ask a question of him before he starts?

Mr. THOMAS. Yes.

COST OF THE NAVY FACILITY

Mr. JONAS. I am serving on the Military Construction Subcommittee this year. I did not last year. Have you requested funds for fiscal year 1959?

Captain METSGER. Yes.

Mr. JONAS. Have you already made your presentation?

Captain METSGER. Yes, sir.

Mr. JONAS. I did not hear all of the Navy testimony this year, but we certainly have a record.

Mr. THOMAS. I imagine it was covered there as in this authorization. You could not find it with a search warrant.

Mr. JONAS. I do not know. We hear a lot of so-called classified information in that committee. I have been amazed to the extent to which off the record discussions have gone. I expect we have heard in that subcommittee this year information that is equally, if not more, sensitive than this. I don't want the captain to disclose anything that should not be disclosed either, but I think he could go off the record and clarify some of the questions that are in Mr. Evins' mind, and some that are in my mind, too. I agree with you, I have not heard anything yet that convinces me that there is not some duplication. You have said there is no duplication, but that is not enough.

Mr. THOMAS. Go ahead, Captain; give us whatever you feel you are able.

Mr. EVINS. They started off with $1,300,000, fund request and now it has come up to $79 million. I think the committee is certainly warranted in having additional facts on this matter.

Captain METSGER. There are several things that can be said on this without a record in executive session at a secret classification level. This means things that would seriously jeopardize the security of the country if they were to leak.

(Discussion off the record.)

COORDINATION OF THE TWO FACILITIES

Mr. BOLAND. When is the National Science Foundation telescope going to be operational?

Dr. BERKNER. If the funds are approved under the present supplement, it is hoped it will be in operation January 1, 1960.

Mr. BOLAND. There is no doubt about the fact that these two installations will be coordinating a lot of their efforts?

Dr. BERKNER. They have to coordinate them from a point of view of mutual interference, and this is going on constantly. In addition to that, if any research time is available at the Navy facility, I can assure you that there will be close coordination. I might add that there are plans for the radio astronomers at the Naval Research Laboratory to make use of the Green Bank facilities. This has been contemplated from the very beginning since the Naval Research Laboratory has joined with us in the scientific planning for the Green Bank facility.

Dr. WATERMAN. This will be for unclassified research.

Dr. BERKNER. Yes.

Mr. BOLAND. The installations are 30 miles apart.

Dr. BERKNER. And there are three mountain ranges in between.

LIVING AND EATING ACCOMMODATIONS

Mr. BOLAND. Would there be any saving to have a central facility for housing? You are going to have dining facilities and housing facilities at both installations. What are you going to spend in the naval program?

Captain METSGER. For support facilities?

Mr. BOLAND. This would be to house people and to feed them. What are you spending in the naval operation?

Commander CUNNEY. If I may answer that question, Captain, that total is $7,800,000 out of the total we set for $79 million for community support facilities—BOQ, mess halls, public work shops.

Mr. BOLAND. What are you spending in the National Science Foundation?

Dr. BERKNER. We are asking for $460,000.

Mr. BOLAND. Why can't you merge those facilities? You say many times you have to be in touch with each other and talk over problems. This would be a nice way to do it. Why couldn't you have a central facility for this?

Dr. BERKNER. While the airline distance is 30 miles, the road distance in that mountainous area is double that. The driving time is a couple of hours. The telescope like this has to be used all hours of the day and night. People get out of bed and put in a couple of hours observational time and turn back in. It is one of our most serious problems to keep people on the spot.

Mr. BOLAND. I can understand that. However, if you combined your facilities for housing and messing, you would save a lot of money. The responsibility of this Committee on Independent Offices and the Naval Subcommittee is to conserve money. You would not need housing facilities in that area, although I can understand your problems.

Dr. BERKNER. You need quite a lot of people on the spot because when you switch experiments it takes more than one person to do it. You have to have the laboratory facilities right there. It is our opinion that it would be much more costly to the Government to have people live off the site than on it.

Mr. BOLAND. You do not need everybody available at the same time for the particular problem you have under study.

Dr. BERKNER. Let me put it to you this way. When a visitor comes down there, he has to work very long hours. We don't want him traveling 2 hours each way, or 4 hours a day driving a car when they could be putting that 4 hours a day into work. It may be that the cost of an hour's availability time for a man will run into many hundreds of dollars. I think by a long shot it would be far more expensive to try to house them away from the site.

Mr. BOLAND. I take it what you say is true with respect to the travel difficulties, but when you said 30 miles I assumed you could put a housing and messing facility up 15 miles from each of the sites and that would serve very well the purpose of each. If there is an opportunity to save some money, you want to cooperate on that basis. If there is not, fine. I am exploring that possibility.

Captain METSGER. May I say something in addition here? If we set up another facility half way between, this would make a total of three facilities requiring security services and so on.

Mr. BOLAND. It would also give you the opportunity of building 1 mess hall which would be cheaper than 2. There also could be an opportunity to build a larger dormitory that is cheaper than building 2 at 2 different sites. That argument does not hold water with me. I am exploring the possibility of these two installations getting together only on the question of messing and housing the personnel who are going there. In my opinion the operation of the two sites is completely different and they are both necessary. I am only trying to find out whether there is an opportunity to save the taxpayers some money with respect to housing andwith respect to messing. You can get the site at $40 or $50 an acre now, and you would not require many more acres for an area to house and mess the people working at both sites.

Dr. BERKNER. I think one could demonstrate by study that it would not only be more undesirable, but more expensive because of the driving distances.

Mr. BOLAND. You explained it, but I could not see where it would be more expensive to put up 1 building instead of 2 for messing and housing and recreation. If we could combine both into one, I can't see how it would be more expensive.

Mr. THOMAS. If you split the difference, it would be 15 miles apart.

Dr. BERKNER. There are three mountain ranges intervening.

Mr. BOLAND. That is the answer.

STAFFING OF THE TWO FACILITIES

Mr. VURSELL. What will be the number of personnel at the naval installation when you are in full production?

Commander CUNNEY. We expect by fiscal year 1963 to have a total of 406, plus about 100 people who will be hired and working there, but who won't be living there. There will be public works maintenance people and others living in the area.

Mr. VURSELL. 406 will be the total personnel.

Commander CUNNEY. Yes, sir, plus another 100 employees who will not be living there. These will be people living at the facility, military and scientific and mostly military.

Mr. VURSELL. That is when the installation is completed.

Commander CUNNEY. Yes, sir.

Mr. VURSELL. How many do you expect, Captain, or Dr. Waterman, when your installation is in being?

Dr. WATERMAN. The total number of employees expected is 71 when ours is in full operation.

MISSIONS OF THE TWO FACILITIES

Mr. VURSELL. It would seem to me, just as an observation, that there is a use and a very clear line of demarcation in the purposes of these two facilities. One is basic research and the other one is, largely, applied research, and, at the same time, there is a possibility of even basic research in the military installation to a certain extent. While I hate to see the amount of money that it is going to cost to develop both of them, in the world of today, with the tensions and implied purposes of other countries to keep these tensions going, and with the ability of countries to operate quickly from a military standpoint. It would seem that there is, probably, and I take it you people feel there is absolute necessity for information that you must gather and that you must have these facilities to gather it. It all adds up to keeping this country free.

I might say I am rather more satisfied leaving this meeting than when I came in here. I do think, when it comes to classified material, that there is entirely too much knowledge of what we are doing given to the press and given to the people for half guesses, which is used for propaganda all over the world. I realize the press likes to have these stories. But I think that this Government and the Congress will make a mistake when they are influenced to any extent by what somebody wants to know. When you tell us what you have in mind, and the executive department knows what you have in mind, I think the confidence is sufficient so that the public can take a rather long guess at it without too much information.

COMMUNICATION WITH CONGRESS

Mr. EVINS. I will agree with my colleague, if the departments will provide the Congress with information. Dr. Waterman testified he did not tell us about the other facilities because he left it up to the ingenuity and cross-examination technique of the Congress to bulldoze through and find the information. If the departments would come before the committee and give us this information, I would

agree with what the gentleman says. They are, too frequently, hesitant and reluctant to provide the Congress with full information. They want to make it all secret, and don't want to disclose information that is essential for a proper determination in these matters of huge Federal expenditures.

Mr. VURSELL. I think there is justification for your statement. At the same time, with a little freer communication between the departments and Congress we would get along a little better.

COORDINATION OF THE TWO FACILITIES

Mr. JONAS. It is admitted that Dr. Waterman and the witnesses from the National Science Foundation have not disclosed to this committee any information concerning the Navy plan. I am willing to accept the statement that Dr. Waterman has made as to his reasons. In addition, I think he probably felt that this Navy project was so sensitive that he should not discuss it. Captain, did you, in your justification before the Military Construction Subcommittee, disclose the fact that the National Science Foundation was in this field and was planning an installation at Green Bank? There were no security reasons which would have kept you from giving that information to that subcommittee.

Captain METSGER. That subcommittee has the complete information on this project, the Sugar Grove naval project.

Mr. JONAS. I am talking about the Green Bank project.

Captain METSGER. I don't recall whether that subject came up. I would not see any purpose in its coming up, since there was not a thought of any duplication or overlap.

Mr. JONAS. Except, Captain, you and I are both taxpayers of the same country. While your particular sphere is in the Navy, and mine is in the legislative field, I can't imagine my justifying the Sugar Grove project before the Military Construction Subcommittee without making a statement that the National Science Foundation was planning to spend several million dollars in that same vicinity on an entirely separate project, which has a relationship to yours. You say there was no statement made to that subcommittee about the National Science Foundation project?

Captain METSGER. The entire hearing was off the record, sir, and I do not recall at this moment what was said there, specifically, although I was there.

COST AND CONSTRUCTION OF THE NAVY FACILITY

Mr. JONAS. How much money has been appropriated so far for the Sugar Grove project? I don't mean authorized. I mean appropriated.

Commander CUNNEY. In fiscal 1957, we had $1.3 million appropriated. In fiscal 1958, the appropriation was $3.5 million, although the authorization that year was 6.6.

Mr. JONAS. What did you ask for in fiscal year 1959?

Commander CUNNEY. In fiscal 1959, we are asking for $63.5 million appropriation and $60 million authorization.

Mr. JONAS. I am speaking only of appropriations.

Commander CUNNEY. $63.5 million appropriation.

Mr. JONAS. $63 million?

Commander CUNNEY. $63.5 million appropriation; yes, sir.

Mr. JONAS. To spend in fiscal 1959?

Commander CUNNEY. To obligate in fiscal 1959, sir.

Mr. JONAS. What is there about your facility that makes it cost so much more than the National Science Foundation equipment?

Commander CUNNEY. Sir, it is a much larger one. As Mr. Trexler has said, it is many, many times larger. The cost of these instruments go up far more than the measurement of size. As buildings go, it is as between the square and the cube.

Mr. JONAS. Who is building the Navy installation?

Commander CUNNEY. The contractor has not been selected.

Mr. JONAS. Will it be contracted?

Commander CUNNEY. Yes, sir.

Mr. JONAS. The Navy won't undertake to build it itself?

Commander CUNNEY. No, sir.

Mr. JONAS. E. W. Bliss is the contractor for the National Science Foundation instrument. You told us that company was the best in the field.

Dr. WATERMAN. That was the best evidence that we had according to AUI who has the responsibility for the construction of the telescope.

Mr. JONAS. Are you considering that same company?

Commander CUNNEY. We are considering them and all companies. This is such a large project that we will wind up with a joint venture.

Mr. JONAS. Are you going to let this contract on a competitive-bid basis or negotiated?

Commander CUNNEY. We are asking permission to have a negotiated contract. We have investigated with many of the firms interested, and we found that they feel that many of the aspects are so new that they would have to put in for risk and contingency.

Mr. JONAS. You plan if you get permission to do so, to do it by negotiation?

Commander CUNNEY. Yes, sir, negotiated contract. It will be a cost-plus-fixed-fee contract.

Mr. JONAS. Is most of the money to be spent on the instrument and its erection?

Commander CUNNEY. The great bulk of the money goes to the installation and its erection.

Mr. JONAS. $79 million as against the National Science Foundation total projected cost.

Dr. WATERMAN. $9,530,000.

Mr. JONAS. I would like to know what there is about the Navy installation that makes it cost seven times as much as the National Science Foundation?

Commander CUNNEY. We have an estimate of total cost for engineering and construction of the basic instrument of $58 million.

Mr. JONAS. For the instrument itself?

Commander CUNNEY. Yes, sir.

Mr. JONAS. And erection.

Commander CUNNEY. Yes, sir.

Mr. JONAS. I guess the cost is increased by reason of the isolated nature of the location.

Commander CUNNEY. Mainly because it is so much bigger.

Dr. BERKNER. May I comment, Mr. Jonas. I know the technical reasons.

Mr. JONAS. Very well.

(Off the record.)

Mr. JONAS. You say you have an estimated cost of $58 million for the instrument and its erection.

Commander CUNNEY. Yes, sir.

Mr. JONAS. Then you have about $7 million for support facilities.

Commander CUNNEY. Yes, sir.

Mr. JONAS. What will the remaining $14 million be for?

Commander CUNNEY. We have the development and procurement of the electronic instrumentation to support the device, $6 million.

Mr. JONAS. You mean that is not included in the $58 million?

Commander CUNNEY. No, sir, that is being done separately.

Mr. JONAS. What does that consist of?

Commander CUNNEY. Mr. Trexler could answer that much better than I can, sir.

Mr. TREXLER. It consists of actually a laboratory building, if you want to put it that way. You remember the statement a few moments ago that there would be about 400 people involved. This is not an instrument with one man watching a dial or listening to a set of instruments.

Mr. JONAS. It is an administration building?

Mr. TREXLER. No, sir, this is an operations building. This has nothing to do with administration. Administration is separate.

Mr. JONAS. Where your technical people will work.

Mr. TREXLER. The technical people who will work at what we call the end organs of the instrument.

Mr. JONAS. That is $6 million.

Mr. TREXLER. It is $6 million for that instrumentation.

### PROCUREMENT OF THE SITE FOR THE NAVY FACILITY

Mr. JONAS. Why did you buy 1,800 acres of land, if you only need 400?

Mr. TREXLER. To have complete control of the area to suppress interference. This is being turned over to the national forests.

Mr. JONAS. I understand. The national forest has all the land it needs, if you will permit me to say so. I don't believe they need 1,400 more acres. I want to know and the record to show why you bought 1,800 acres of land if you only needed 400.

Commander CUNNEY. Sir, if this had all been private land, we would have needed more than 1,800 acres. We would have needed everything out to a radius of 1 mile from the instrument. By buying the remaining private land and using part of the national forest, we were able to keep our purchase down to 1,800 acres. By transferring to the national forest they will manage it for us much cheaper than we can manage it ourselves.

Mr. JONAS. You mean manage the 1,800?

Commander CUNNEY. They will manage everything out to a mile radius, to give us the interference protection we need. They will manage it cheaper than the Navy could do it, and not add to the Navy installation.

Mr. JONAS. Why didn't you locate it within the forest?

Commander CUNNEY. We tried our best to get it entirely within the forest. The site we found is on the edge of the forest.

Mr. JONAS. I think I know the answer to this, but I would like the record to show why you did not pick 400 acres in the 2,700 acres at Green Bank and build your instrument on the land that the National Science Foundation was buying.

Commander CUNNEY. Mr. Trexler will answer that better than I can.

Dr. WATERMAN. This would interfere completely with the installation at Green Bank for the reason that it would create noise in its transmission which could not be tolerated with our instrument.

Mr. JONAS. Will the 30-mile limitation eliminate the noise?

Dr. WATERMAN. That is one reason why there had to be close cooperation on the technical procedures.

Mr. JONAS. You say the transmitting noise would have been too much if it were located nearer?

Dr. WATERMAN. At the same site, yes.

Mr. JONAS. That required the location at a 30-mile distance?

Dr. WATERMAN. And because there are three high mountain ranges in between. This has been looked into very carefully.

Mr. JONAS. Since this is such a highly secret and sensitive mission, I am a little bit concerned—my first inclination was to express the same concern as Mr. Boland, and I am just as interested as he is in trying to consolidate activities into one where you can save money if you are not too close to the National Science Foundation, because they tell us they are going to allow scientists from all over the world in there if they want to come. Isn't that getting pretty close to your operation?

Captain METSGER. We feel it is not, sir. We feel there is adequate security.

Mr. JONAS. They are bound to find out what is going on at Sugar Grove if they are at GreenBank.

Mr. THOMAS. They will be visiting each other.

### COST AND MISSIONS OF THE TWO FACILITIES

Mr. EVINS. One of the gentlemen testified in answer to the question propounded by the chairman as to whether there is any duplication, he said there is no duplication in operation. That implied that there is duplication in other fields as Mr. Boland brought out.

Mr. JONAS. Of course, there is duplication in all of the support activities. I think you would admit that.

Mr. THOMAS. Mr. Jonas, would you yield before you complete your examination?

Mr. JONAS. Yes, sir.

Mr. THOMAS. We have fought and won World War II. We fought in Korea, and here we are embarking upon another hundred million dollars. If it is so essential now, how is it we did so well in World War II without it? A hundred million dollars is a tremendous amount of money, gentlemen.

Mr. JONAS. Plus two million per year for operations.

Mr. SCRIVNER. This is one of a dozen fields where you are going into one hundred or two hundred million dollar programs that are

so far advanced from World War II and Korea so that when those wars were going on nobody even conceived of them.

Mr. JONAS. Captain, would you want to say anything in response to that?

Captain METSGER. I would simply say that the things that won World War II and Korea for us would not begin to win any next war. The whole base line is so thoroughly different that there just is no relation. There is no relation between a megaton bomb and high explosives.

Mr. THOMAS. We had communications then and navigation then.

Mr. MILLER. You have supersonic speed now which you did not have in any quantity then.

Mr. THOMAS. Will this make your problems vastly different compared to what they were then?

Captain METSGER. Yes, sir.

SECURITY MEASURES RELATING TO THE NAVY FACILITY

Mr. JONAS. You say you have adequate security measures?

Captain METSGER. The situation is not defective in any security way.

Mr. JONAS. I don't see how you can be sure of your security if you are going to permit visiting scientists at all hours.

Mr. BOLAND. Will the gentleman yield? I think Mr. Jonas makes a good point. Today you can't tell us the size of the telescope and nobody has asked, but is it possible for these visiting scientists, and you have indicated we will have scientists from all over the world if they want to come at Green Bank, is it possible that these people could see this instrument?

Mr. TREXLER. It will be a tourist attraction. We realize that, sir.

Mr. BOLAND. I know. We don't mind it being a tourist attraction.

Mr. TREXLER. And it can be seen.

Mr. BOLAND. As Mr. Jonas suggested, the question of security has been raised here. You have been reluctant to give us the size of the instrument that the Navy is going to operate. After it is in operation, isn't it possible that those people who come there who may not be friends of ours could see this?

Captain METSGER. Yes.

Mr. BOLAND. What difference does it make whether or not we know today what size it is going to be, and they know what size it is going to be when they get there?

Captain METSGER. This is a matter of general military application. We try to conceal our future moves from our enemies as long as it is possible to do so.

Mr. BOLAND. Does it make any difference to the security of the United States whether or not some people know the size of the instrument that you are going to have at Sugar Grove?

Captain METSGER. Yes, sir.

Mr. BOLAND. Is it going to be making any difference in 1962?

Captain METSGER. Yes, sir, but we can't conceal it beyond that point.

Dr. BERKNER. In 1962, they will know, but only people who have been cleared for military security at our installation now are aware of either the operational purposes or the size of the installation.

Mr. BOLAND. Now. But how about 1962?

Dr. BERKNER. Three years is a great gain over an enemy in time advantage.

Mr. BOLAND. So, it perhaps would not make much difference if they knew what the size was in 1962?

Mr. TREXLER. No. We expect that, when construction starts the size will be known. We have not been authorized to start. It has not been released.

MISSIONS OF THE TWO FACILITIES

Mr. JONAS. The only other question I have, and either Dr. Waterman or the captain can respond to it, all kidding aside, and getting right down to the meat and the coconut of it, there is complete duplication except with respect to mission; is that not true? There is no duplication of mission, but you do not, really, seriously, contend that there is no duplication in the instrument?

Captain METSGER. There is no duplication in the instrument.

Mr. JONAS. They are different instruments, but they can both be used for basic research; can't they?

Captain METSGER. Not the same research.

Mr. JONAS. Not at the same time and not directed at the same object. But isn't it true that, when you say there is no duplication in mission, you go about as far as you can to deny duplication?

Captain METSGER. My answer to that, sir, would be that, taking the instruments alone, one is optimized for one kind of operation, the other for a completely different mode of operation. Even if they were being used for the same purpose——

Mr. JONAS. They cannot both be optimized for the same purpose?

Captain METSGER. Not this design.

Commander CUNNEY. Sir, you might say that one is about the scale of an aircraft carrier and the other is about the scale of a destroyer, and both have functions as different as those two ships.

Mr. JONAS. If you build 2, and 1 is an inch bigger than the other, they are different, but they are not materially different.

Commander CUNNEY. These differences are so much that it is as different as between a destroyer and an aircraft carrier.

Mr. THOMAS. Why not let these scientific experts speak on this subject?

Mr. JONAS. There is one other question before we do that. I would like to find out where the $55 million figure came from. Didn't the newspaper say that the National Science Foundation project will cost $55 million?

Dr. WATERMAN. The National Science Foundation never said this.

Mr. JONAS. Wasn't that in the story?

Dr. WATERMAN. It was in the newspaper article, I believe, but I don't know where it came from.

Mr. MILLER. I am satisfied, from what these gentlemen say, that the purpose and needs and the functions of these two installations are entirely separate, just as separate as the Navy is from the National Science Foundation. I was not here at the opening part of the discussion, but, as far as I am concerned, I think it is more or less a matter of coincidence, or it would seem that the area being suited for one thing is also suited for the other, and that is probably why they are close together, just as, frequently, similar industries locate in a similar locality without having any connection between the two.

Mr. JONAS. You mean Standard Oil builds across the street from Texas Co. because the corner is good?

Mr. MILLER. I was not going quite that simple, because they are competitors. For instance, photographic laboratories often set up near where you are having motion pictures. They are working with the same factors, but for different ends, as I understand it. I can appreciate that, as far as the Navy is concerned, high classification is necessary. It seems obvious, to me, that a question of lead time always enters into these things. It may be true that your deployment is obvious in 1962, but it would certainly be a great disadvantage to have our story known 2 or 3 years ahead of time. As far as I am concerned, I am satisfied with the explanation.

Mr. THOMAS. Do you think there is anything unique in those hills and hollows in West Virginia that is not unique in thousands of other locations in the United States?

Mr. MILLER. I would say that the city of Washington has a lot of highly classified installations in its midst, from the Pentagon on down to Fort Meade, and the fact that people come and go does not open it up.

Mr. THOMAS. It has been testified that they had scientific engineers. I imagine there are hundreds of places in New Mexico, northern California, perhaps in Colorado, and all through there, where the same conditions exist. There are no industries within miles and miles, and it is just about as far south as this. Maybe it is a little farther.

Mr. SCRIVNER. I would have to take exception to that.

Mr. THOMAS. Under the old guise of military need. We have all gone through that mill for 20 years around here.

Mr. SCRIVNER. I do not know the whole story, but, from what I do know of the location of these devices, it is peculiar.

Mr. THOMAS. They are bound to be good. Certainly, they would not put it there if it was not good.

Mr. SCRIVNER. I know. Their statement shows that they considered localities throughout the country.

Dr. WATERMAN. Thirty different locations.

Mr. SCRIVNER. And, finally, narrowed down to 3, and then boiled down to 1.

Dr. WATERMAN. In addition to the careful search and the discovery that this area in West Virginia was ideally suited——

Mr. THOMAS. Was there any other location that would give you a minute's thought, other than West Virginia?

Dr. WATERMAN. This was the best protected and best shaped area, topographically, that could be found. Furthermore, the Federal Communications Commission is willing to make arrangements to have

this more quiet than would be the case otherwise by limiting radio transmission and thus protecting the area from outside interference.

Mr. THOMAS. They would have protected any other area you would have asked them.

Dr. WATERMAN. That is the reason why the location of these two sites should be in the same area; to get the same protection.

Mr. MILLER. I was about through, Mr. Chairman. I am interested in the statement. I do not think I have any further questions, Mr. Chairman, that would not be repetitious. I am satisfied with the situation.

Mr. THOMAS. Thank you, gentlemen, very much.

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